CLAIMS

What is claimed is:

1. A method for performing high aspect ratio gap fill during planar lightwave circuit top clad deposition, the method comprising the steps of:

a) forming a plurality of waveguide cores on a substrate, the waveguide cores having a plurality of gaps there between; and

b) forming a cladding layer over the waveguide cores and the substrate using an HDP (high-density plasma) deposition process, the cladding layer having a lower refractive index than the waveguide cores.

2. The method of claim 1 further including the step of performing an anneal process after the HDP deposition process.

3. The method of claim 1 wherein the gaps between the waveguide cores are smaller than 2 microns.

4. The method of claim 3 wherein the aspect ratio of the gaps between the waveguide cores is greater than 3.

5. The method of claim 1 wherein the HDP deposition process deposits high purity USG (undoped silica glass) to provide a uniform refractive index for the cladding layer.

6. The method of claim 1 further including the step of forming an overlying layer over the cladding layer using a PECVD (plasma enhanced chemical vapor deposition) process.

7. The method of claim 6 wherein the overlying layer is a doped silica glass layer.

8. The method of claim 7 wherein the doped silica glass is BPSG (Boron Phosphorous sillica glass) or GeBPSG (Germanium Boron Phosphorous sillica glass).

9. The method of claim 1 wherein the HDP deposition process ~~deposits~~ with dopants Germanium, Boron, and Phosphorous, in any combination or individually.

10. A method of making an optical waveguide for a planar lightwave circuit, the method comprising the steps of:

a) forming a bottom cladding on a silicon substrate;

b) forming a waveguide core layer on the bottom cladding, the waveguide core layer having a higher refractive index than the bottom cladding;

c) forming a plurality of waveguide cores from the waveguide core layer, the waveguide cores having a plurality of gaps there between; and

d) forming a top cladding over the waveguide cores using an HDP (high-density plasma) deposition process to form an optical waveguide of a planar lightwave circuit.

11. The method of claim 10 further including the step of performing an anneal process after the HDP deposition process.

12. The method of claim 10 wherein the gaps between the waveguide cores are smaller than 2 microns.

13. The method of claim 12 wherein the aspect ratio of the gaps between the waveguide cores is greater than 3.

14. The method of claim 10 wherein the HDP deposition process deposits high purity USG (undoped silica glass) to provide a uniform refractive index for the cladding layer.

15. The method of claim 10 further including the step of forming an overlying layer over the cladding layer using a PECVD (plasma enhanced chemical vapor deposition) process.

16. The method of claim 15 wherein the overlying layer is a doped silica glass layer.

17. The method of claim 16 wherein the doped silica glass layer is BPSG (Boron Phosphorous sillica glass) or GeBPSG (Germanium Boron Phosphorous sillica glass).

18. The method of claim 10 wherein the HDP deposition process deposits dopants Germanium, Boron, and Phosphorous, in any combination or individually.

with → deposits

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19. A method of making an AWG (arrayed waveguide grating) planar lightwave circuit, the method comprising the steps of:

a) forming a bottom cladding on a substrate;

b) forming a waveguide core layer on the bottom cladding, the waveguide core layer having a higher refractive index than the bottom cladding;

c) forming a plurality of waveguide cores from the waveguide core layer, the waveguide cores having a plurality of gaps there between;

e) forming a HDP (high-density plasma) layer over the waveguide cores using an HDP deposition process to form an optical waveguide of an AWG planar lightwave circuit; and

f) performing an anneal process after the HDP deposition process.

20. The method of claim 19 wherein the gaps between the waveguide cores are smaller than 2 microns.

21. The method of claim 19 wherein the aspect ratio of the gaps between the waveguide cores is greater than 3.

22. The method of claim 19 further including the step of forming a PECVD (plasma enhanced chemical vapor deposition) layer of BPSG (Boron Phosphorous silica glass) or GeBPSG (Germanium Boron Phosphorous silica glass) over the HDP layer using a PECVD process.